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Potential of silk sericin based nanofibrous mats for wound dressing applications.

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Wound dressing developed using bioactive materials has been a current area of research for treating chronic non-healing wounds owing to its high demand. Here, we report the fabrication and evaluation of nanofibrous matrix based wound dressings using biopolymer poly(vinyl alcohol) (PVA) incorporated with silk sericin (SS). SS extracted from the cocoons of mulberry variety Bombyx mori and non-mulberry variety Antheraea assama has been used to develop two types of blended mats. Herein, SS based nanofibrous dressings fabricated using electrospinning technique were thoroughly characterized and evaluated for wound healing applications. The developed SS based nanofibrous mats ranged from 130 to 160 nm in diameter with micro to nanoporous structure. The dressings were endowed with free radical scavenging capacity, antibacterial activity, swelling capacity, and biocompatibility due to incorporation of SS. Furthermore, murine fibroblasts (L929) and human keratinocytes (HaCaT) cultured on the PVA-SS blended mats showed higher proliferation as compared to pristine PVA mats as observed over a period of 14 days ($p \leq 0.01$). The blended mats also showed spread out morphology of cells in comparison to spherical clumps formed on PVA mats. In addition, SS from both silk types exhibited excellent antioxidant potential without hampering the cell viability even under H_2O_2 driven oxidative stress. Moreover, SS (both types) released from the nanofibrous mats also healed the wounds at thrice the rate of control under in vitro conditions. Furthermore, subcutaneous implantation of nanofibrous mats in mice showed in vivo tolerance of the blended nanofibrous mats observed over four weeks without eliciting any inflammatory reactions to the host tissue. Taken together, the developed silk sericin-based dressings signify an attractive substrate for treatment of chronic wounds like diabetic foot ulcers.